Software Project Management
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Lecture – 55
SEI CMM (Contd.)

Welcome to this lecture. Over the last couple of lectures, we have been looking at the software quality management issues and if you remember we had said that for effective quality management, an organization must have a quality system. And there are several quality standards, quality system standards that are available used throughout the world. We had discussed about ISO 9001 and then we had been looking at the software engineering institute capability maturity model.

We had looked at the 5 models and what are the quality system that is required at the different levels. The 5 levels of SEI CMM and the quality system requirements at each of the level. And also we had said that the CMM gives a step wise approach to improve the quality at an organization and this is known as the KPAs or the Key Process Areas.

An organization at a certain level that wants to improve its quality standard to the next level, will have to incorporate certain key process areas. It has to focus on improving some key process areas that is clearly defined by SEI CMM. In the last lecture, we had just started looking at the key process areas, now let us continue from there.

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We will first look at the key process areas and then we will compare the CMM with ISO 9001 and after that we will look at the personal software process.

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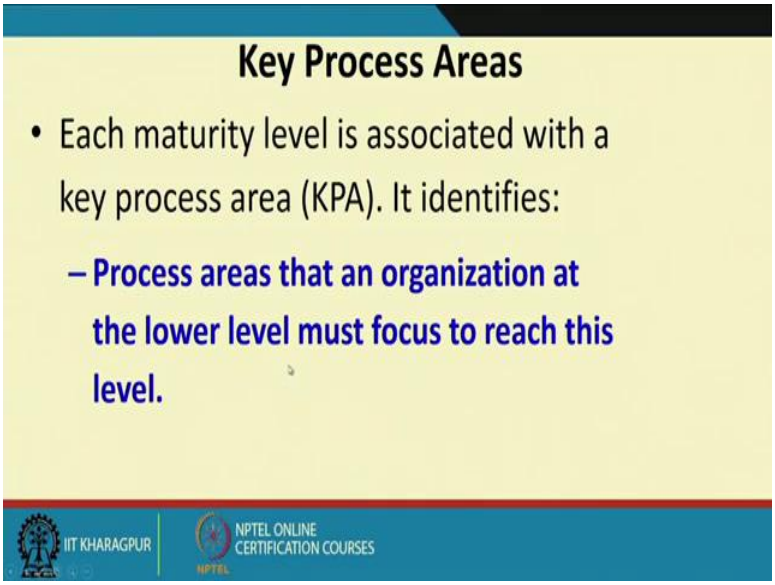

The key process areas are defined for every maturity level of the SEI CMM. The KPA identifies the process areas that an organization at a lower level must focus to reach this level, that is suppose an organization is assessed at level 2 and it has to, it needs to improve its process its quality system to level 3. Then it must look at the KPA is identified for level 3 and focus on those.

In that sense, the KPA is a very important concept here in the CMM and it gives a step by step approach to improve the quality at an organization.

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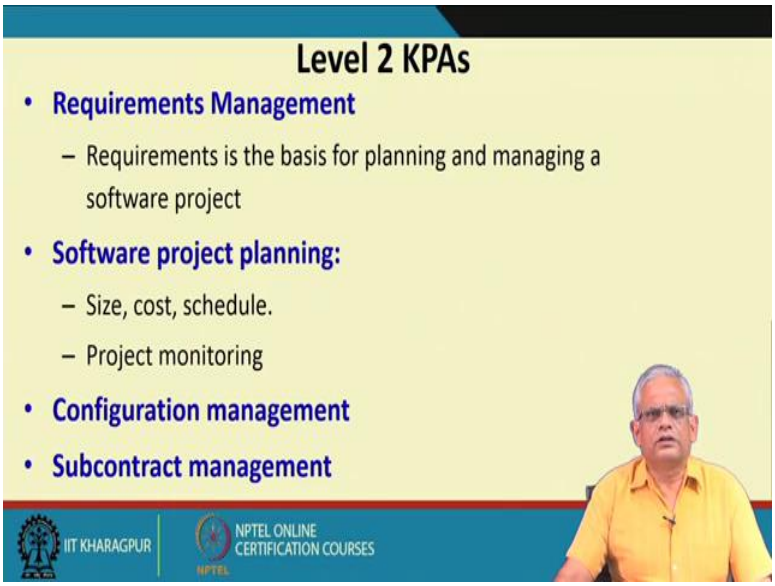

For the level 1, there are no KPAs because every organization by default is at level 1, it does not need even a process. So, there is no process areas, key process areas identified for level 1. Now, let us look at the level 2 KPAs that is if an organization is assessed at level 1, what are the process areas it must focus to improve its quality system to level 2.

The first thing identified in the KPAs is requirements management, that is the organization must have proper requirement specification and also how does it manage the requirements that is the changes in the requirements how are these controlled. This is important because requirements is the basis for planning and managing a software project that is identified by the CMM, requirements is a fundamental document, is a basic document which is required for many purposes including planning and managing a software project.

Another aspect process area which is highlighted is the project planning and monitoring. So, this is basically the software project management. Unless a organization has a project manager who estimates the size cost, makes plans according to the size cost, develops a schedule and then monitors the progress, the organization cannot be assessed at level 2, one of the emphasis of the level 2 process is the project management. It is identified that project management is one of the basic aspects of a project without which the project is hard to become success.

Another issue that is process area that is identified is configuration management. A configuration management tool must be used, so that various documents can be put under configuration control, the requirements document, the design document and so on. So that, the changes to this can be authorized that is who changes it is not that anybody can change, an authorized person can change the document and also it should be possible to identify the latest configuration or the latest version of the document and also to be possible to find out what changes have occurred so far and so on.

The ones that are the process areas that are identified for level 2 are some of the basic aspects of a software project without which it is very difficult to go to the higher levels, the going to level 3, level 4, etcetera without incorporating this basic process areas would be counter productive. The other process area is subcontract management.

Every project at some point or other needs to give out work, well defined pieces of work to other vendors and how are these specified is the contract clearly specified what is the work to be done and when getting the delivery is it checked against those specification. So, those are subcontract management. So, the level 2 KPAs are 4 important KPAs. There are other KPAs, but we have just highlighted here most important ones, requirements management, software project planning, configuration management and subcontract management.

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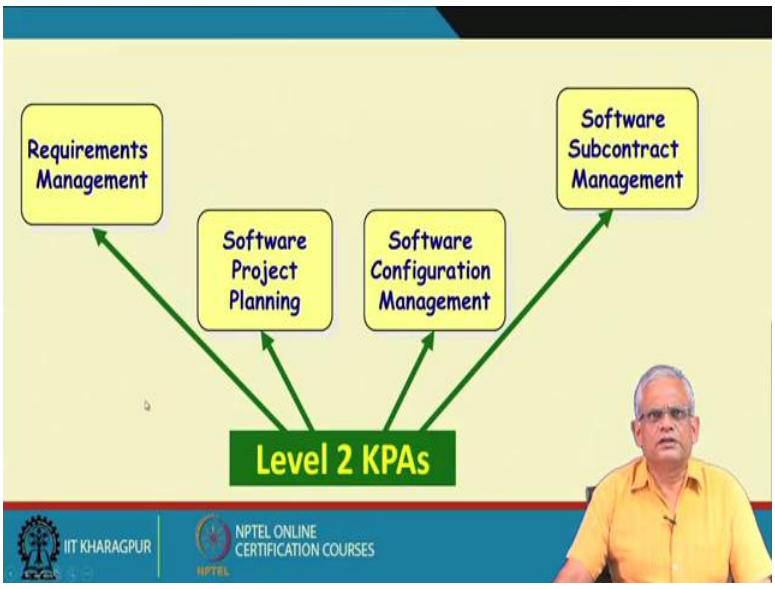

Just represented this in a diagrammatic form here. The level 2 KPAs are 4 process areas requirements management, software project management, that is software project planning monitoring and so on, software configuration management and software subcontract management.

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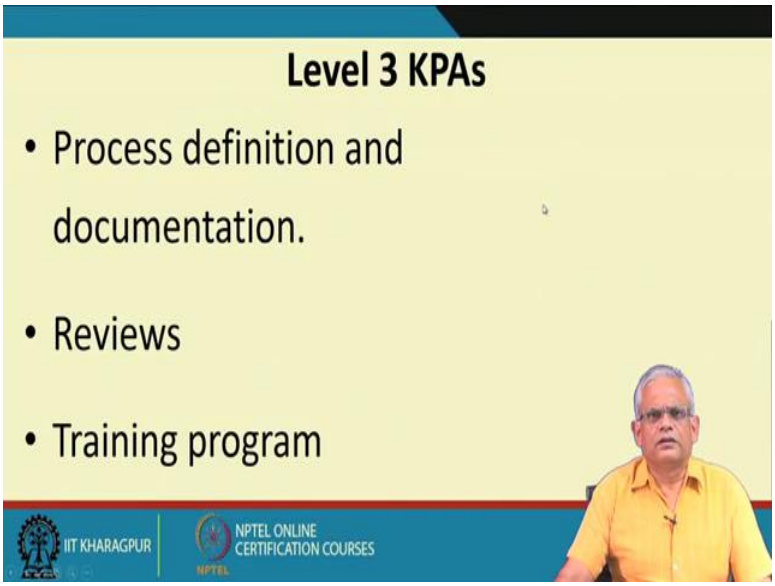

The level 3 KPAs are the ones are the process areas which a level 2 organization must focus and incorporate in order to improve its process to level 3. The level 3 KPAs are process definition and documentation. In level 2 different developers might be using their own process, but there is no standard understanding of which process is being followed, there is no documented process available in the organization whereas, in a level 3 organization the process that will be used by all developers is clearly defined and it is documented in the form of a process handbook.

Reviews are carried out at various stages, the requirements are reviewed, design is reviewed, code is reviewed and so on. And the third process area is training program it is identified that the skills for software development is continually changing, and unless the developers keep up with the latest developments it would be heard for a project to succeed and therefore, periodic training program is another issue which is highlighted by the level 3.

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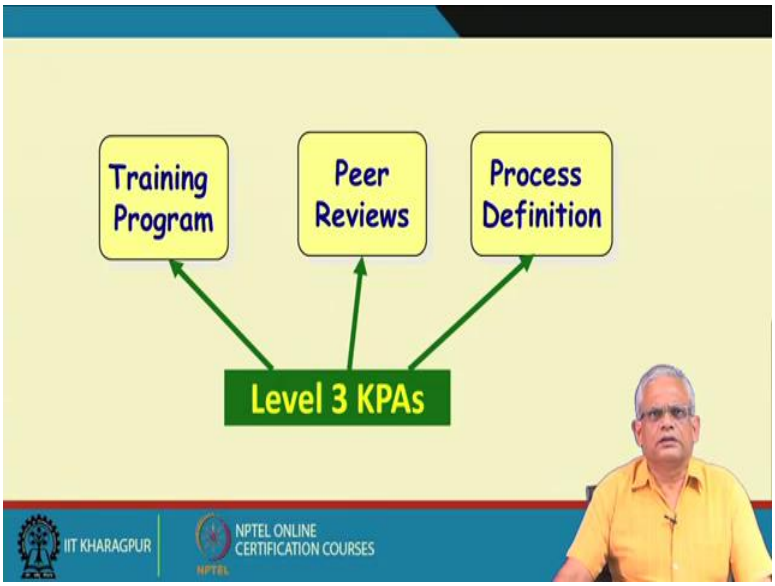

Represented this in the form of a diagram. 3 important level 3 KPAs training program, peer reviews of various documents and process definition and documentation.

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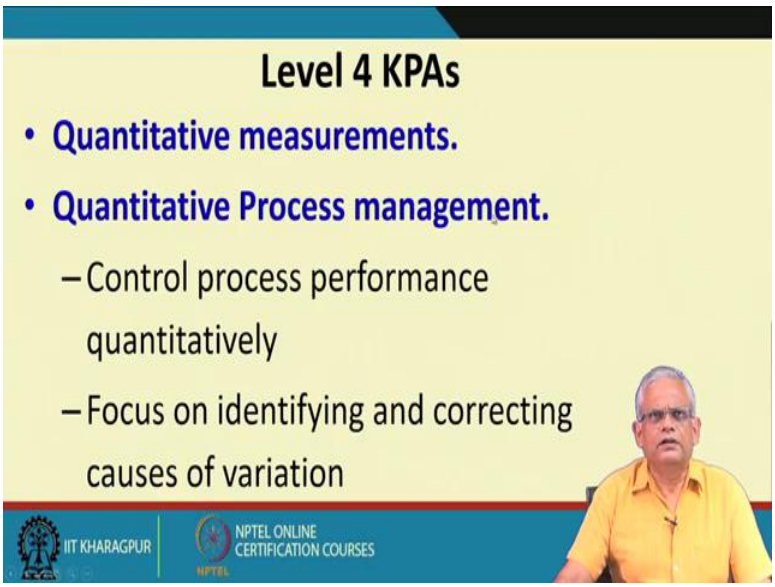

The level 4 requires measurements of the process performance, both the process and product metrics are obtained and there is a quantitative process management, that is based on the measurements and the process and the product, if there is a deficiency somewhere then it is identified why this is occurring.

May be the development team is not strictly practicing some process and therefore, it focuses on identifying and correcting the causes of variation. If the defect rate that is identified after testing is high, then possibly the testing was not proper, may be the testing was not done rigorously and therefore, the project manager identifies that what caused the metrics to miss the specified values and then it takes a counter measures. So that, the process variation is reduced.

In summary here, for level 4 KPAs process and product measurements and using this measurements quantitative process management is practiced here. If there is a deficiency in any of the measured attributes it is identified and corrective action is taken, but one thing must point out that the corrective action here does not really imply changing the process. For example, the testing is not effective because certain types of tests were not documented in the process document that is not identified actually at level 4.

The level 4 only tries to find out why there is a variation in the process that is sometimes there are more defects for example, and then identifies what action needs to be taken by the project manager to correct that deficiency.

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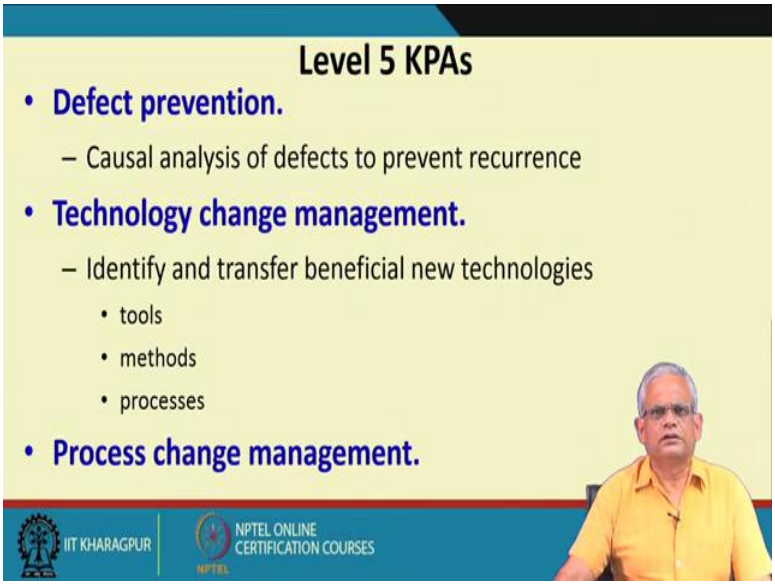

The level 5 KPA on the other hand, it one of the focus is defect prevention that is identifies what is causing the defect and then if necessary change the process. The level 4 assumes that the process is all right, no changes requires only the way it is enforced or practiced is causing the process variation which is causing the defects whereas, in the

level 5 the defects are analyzed their causes and if necessary the process would be changed.

The other process area that is identified as the level 5 KPA is technology change management. In the area of software development the technology changes rapidly and therefore, there must be a group in the organization whose sole work is to identify latest and beneficial new technologies and transfer these into the process and organization wide. The different tools that are become available new methods, new processes, these are all identified and incorporated into the process.

The other process area that is identified is process change management. The process continually changes in a level 5 organization and therefore, the process itself must be put under configuration management. So that, the latest process can be identified. There can be different versions of the process which are applicable to different teams and therefore, the process changes need to be managed, otherwise what is the latest process, latest state of the process would be difficult. The process itself is put under configuration control.

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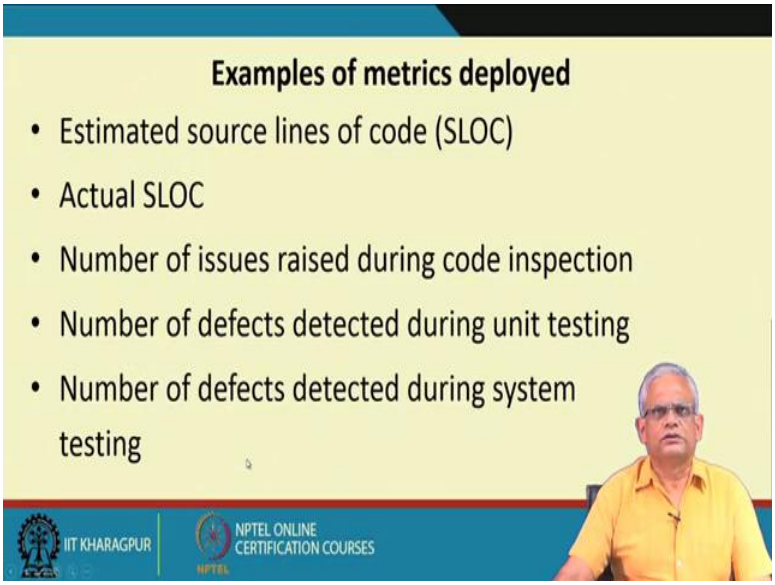

In the level 4 KPA, we had identified quantitative measurement and the process in product and based on this the project manager identifies deficiencies and determines what is causing the variation and takes corrective action. Some of the metrics that are deployed, here there are few examples. The estimated source lines of code and the actual lines of code, the estimated source lines of code and the actual source lines of code.

Across project, the estimated lines of code and the actual lines of code the variation must be bounded if for some project the estimated source lines of code is very different from the actual source lines of code and the project manager needs to introspect and identified what causes the variability, what aspects were not considered, what went wrong and so on.

The number of issues raised during code inspection, the number of defects detected during unit testing, the number of detected defects detected during system testing these are also important metrics. The number of issues raised duuing code inspection these are much smaller compared to the defects detected during unit and system testing; that means, the code inspection is not working properly.

And similarly if the number of defects detected during system testing is too many, then possibly the unit testing and code inspection did not work properly.

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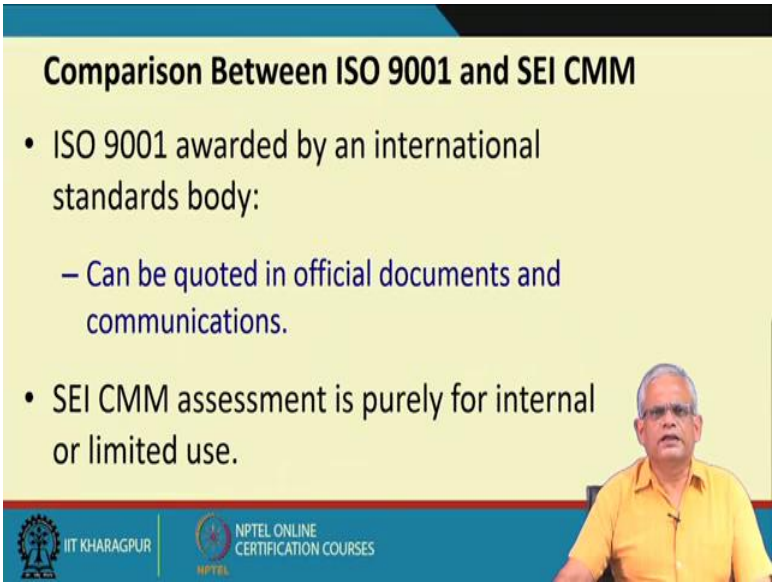

So, far we have looked at two quality standards the ISO 9001 and SEI CMM. Let us quickly compare these two standards. The first thing to note is that ISO 9001 is awarded by an international standards body, but Software Engineering Institute is not a standards body. It has just made some recommendations to the department of defense and which we are using and therefore, the ISO 9001 can be quoted in official documents and communications and the this can be accepted where these are given.

On the other hand the SEI CMM assessment is purely for internal use that is an organization wanting to improve its process uses the SEI CMM assessment or an organization trying to select a vendor uses its own CMM assessment on the organization.

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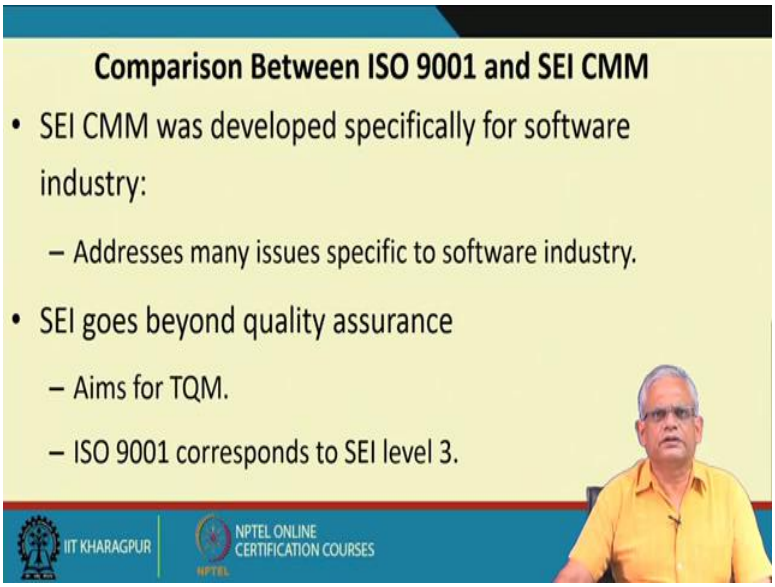

The second issue is that the SEI CMM is very focused on the software industry whereas, the ISO 9001 is used across various industries and therefore, the SEI CMM addresses many issues which are specific to the software industry which are not really taken care by the ISO 9001. And also the SEI CMM targets for total quality management.

unlike the ISO 9001, the original ISO 9001 document which was proposed in 1987, it targets only quality assurance that is the level 3 of SEI. So, roughly the ISO 9001 that was brought out in 1987 corresponds to the level 3 of the SEI CMM, but of course, the ISO 9001 the 2000 version, the one that came out in 2000 version and later they also target for TQM.

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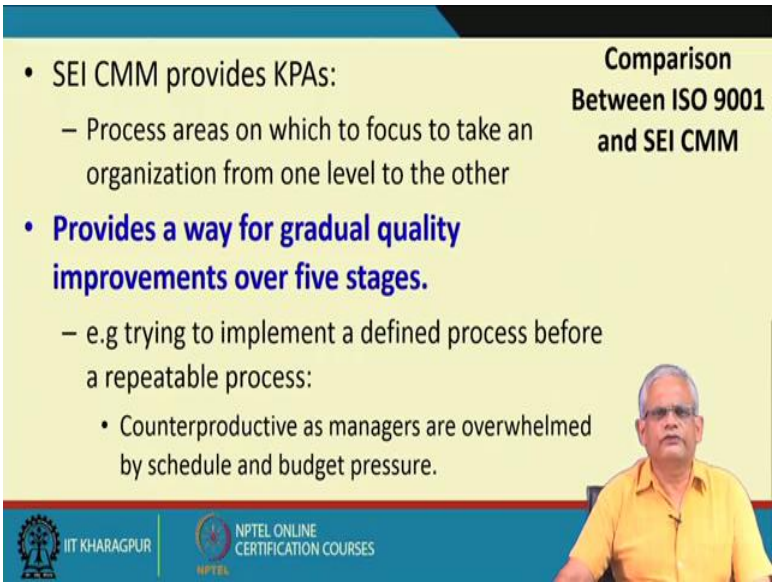

Another major difference is that the ISO 9001 provides a go, no go solution that is an organization either qualifies for ISO 9001 or does not. Whereas, the SEI CMM it provides a step by step approach by which an organization can improve its quality, that is starting at level 1 or very poor quality, very poor quality system. It can reach level 5 through a step by step approach.

It provides a way for gradual quality improvement over 5 stages and also it clearly identifies at each level what is the most pertinent or important process area that it needs to focus, that is if a level 2 organization without really focusing on level 3 KPAs it tries to focus on level 4 KPA then it will be counterproductive.

Let us say a level 1 organization without really practicing the project management, configuration management, requirements management etcetera it tries to have a defined and documented process. It will not be counter product, it would be counterproductive because the managers would be overwhelmed by schedule and budget pressure because the basic project management aspects are not there, the configuration management is not there and having a process and using it will not benefit much.

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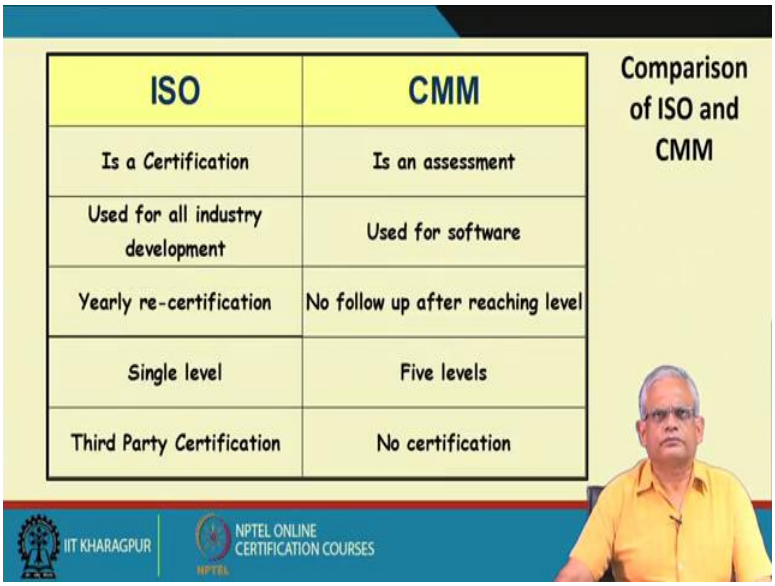

So, this is a tabular comparison, ISO is a certification whereas, CMM is just an assessment. ISO is generic used across all industries. CMM is used for software. ISO requires yearly recertification, whereas, in CMM it is not necessary that it has to be reassessed ISO either pass or fail whereas, CMM are 5 levels through an organization can improve its quality system. ISO is actually a third party certification, ISO does not give the certification as we had said.

It is only the accreditation agencies per specific country they provide the certification whereas, CMM there is no certification actually.

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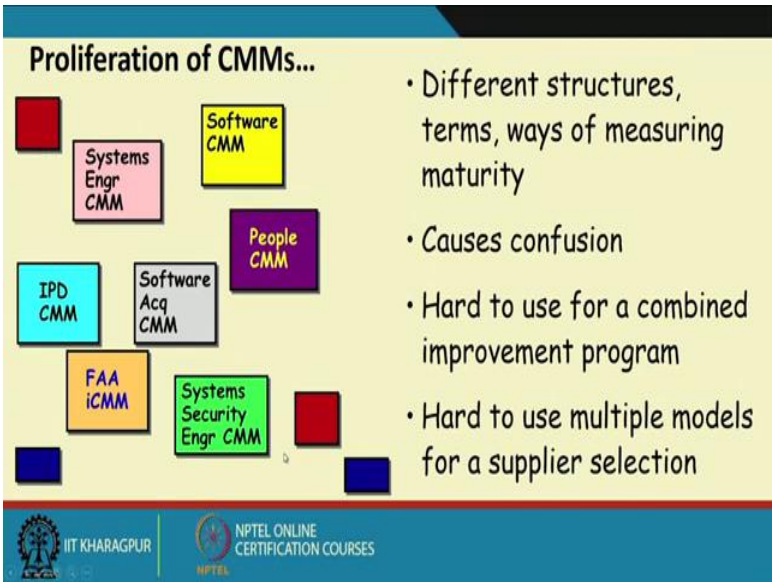

But then over the years lot of CMMs came into place. CMM for software development, CMM for systems engineering that is both hardware and software combined developments, CMM for software acquisition, people CMM or the CMM for people management security engineering CMM etcetera. These are all pertinent these are all relevant to an organization, but then each had its different structure, different terms were used the different ways of measuring the maturity which caused confusion.

And when an organization tries to use CMM as a whole for all its activities including acquisition and so on it was very hard because these had different terminologies and different ways of measuring the maturity. And also if multiple areas an organization had to select supplier it was very difficult.

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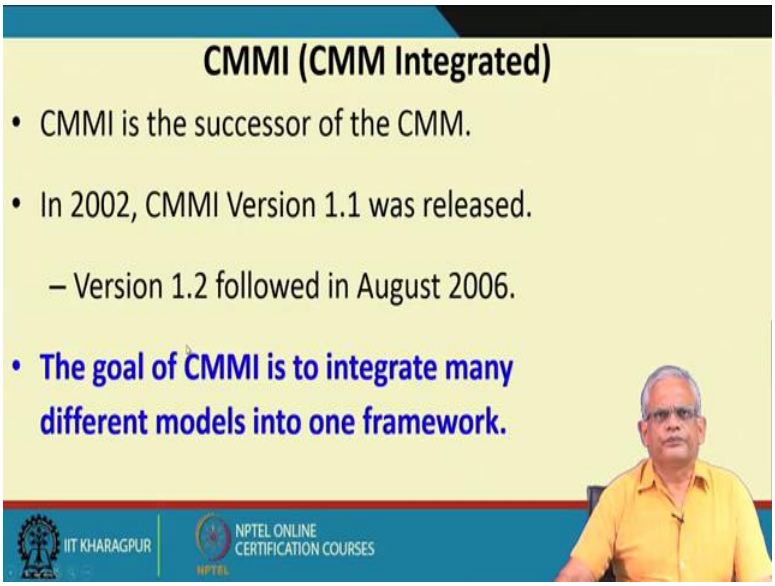

And with this the CMMI was proposed in 2008, 2002 and later it has been revised several times. The main idea here is integrating large number of CMMs that an organization would have to deal with into a single one.

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But then there are 3 flavours of CMMI, one is for development where there is which is applicable for software engineering, system engineering collaborative teams and acquisition of suppliers, acquisition from suppliers. There is CMMI for service industries, these are used across different industries from taxi aggregators to call centers,

they use CMMI for service and then CMMI for acquisition which is used for acquiring products and services.

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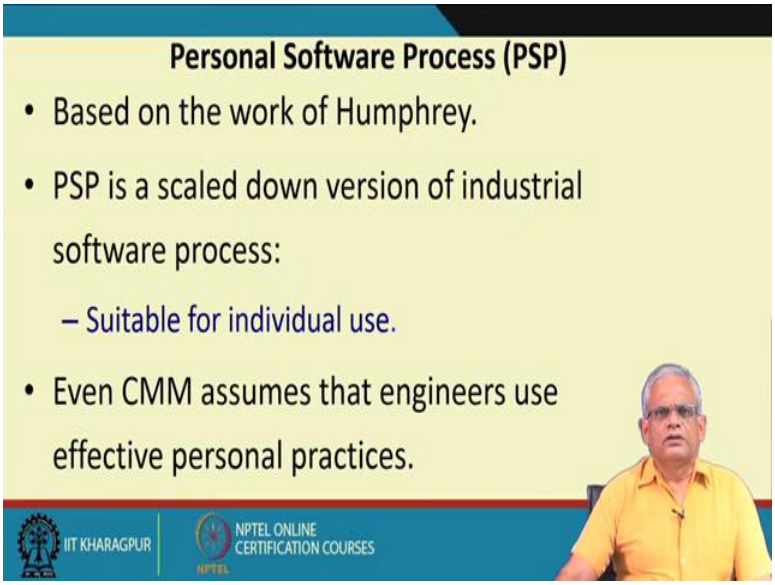

We are already at the end of the lecture time. We will just stop here. And in the next lecture we will discuss about the personal software process or PSP.

Thank you.